

To: Jacob A Fleck [jafleck@usgs.gov]
Cc: []
Bcc: CN=Karen Schwinn/OU=R9/O=USEPA/C=US@EPA@EPA;CN=Erin
Foresman/OU=R9/O=USEPA/C=US@EPA@EPA[]; N=Erin
Foresman/OU=R9/O=USEPA/C=US@EPA@EPA[]
From: CN=Tim Vendlinski/OU=R9/O=USEPA/C=US
Sent: Tue 5/8/2012 3:51:33 PM
Subject: Re: reply requested: questions posed by ICF regarding MeHg and LICD (Bay Delta
Conservation Plan)
[icfi.com](http://www.epa.gov/region9/water/watershed/sfbay-delta/index.html)
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Thanks for your prompt and excellent response, Jacob!

From: Jacob A Fleck <jafleck@usgs.gov>
To: Tim Vendlinski/R9/USEPA/US@EPA
Cc: "Healy, Erin" <EHealy@icfi.com>, Tamara Kraus <tkraus@usgs.gov>
Date: 05/08/2012 07:11 AM
Subject: Re: reply requested: questions posed by ICF regarding MeHg and LICD (Bay Delta Conservation Plan)

Hi Tim et al.,

you are correct in your responses but a couple things should be highlighted.

on question 1: It should be stated explicitly that the restoration of "natural" hydrology is infeasible in the deeply subsided portions of the Delta. The degree of subsidence over the past 150 years has left some islands 9 meters below sea level. Without management of the water levels, the islands would end up like Frank's Tract (large tidally influenced lakes that serve little ecosystem function). The intent of the managed wetlands on deeply subsided islands is to 1) stabilize the levees 2) reverse subsidence such that over time land surface elevations may reach the natural tidal connectivity and ecosystem function (likely decades from now). if the islands continue under current management there is almost certain to be levee failure and total flooding.

on question 2: mercury is being sequestered in the wetlands but it is not "concentrating" per se. the mechanism used to sequester the mercury is to use it's association with organic matter to precipitate it out into the sediment. this process sequesters the mercury but at the same ratio to organic matter as is in solution so the relative ratio of mercury to organic matter stays the same. further, the organic matter accumulation in the wetland would likely further reduce the mercury to organic matter ratio as the wetlands are designed to sequester organic matter (carbon) at high rates. therefore, instead of concentrating mercury relative to the surrounding environment, the mercury to organic matter ratio is likely to actually improve within the wetlands. The concern as Tim points out is whether the mercury is available for methylation which is the real mercury concern but as mentioned, the coagulant appears to perform well in removing the mercury and methylmercury from the system in a stable manner. The purpose of the research we will be conducting is to confirm that the mercury is bound in a stable form and not exacerbating the problem and through other research understand what the processes are that may affect whether it is stable or not under different scenarios. some of this work has been done in the lab but additional funding is needed to address the process side of things.

if you have any further questions or would like further explanation on these issues please feel free to contact me.

Jacob

From: Tim Vendlinski <Vendlinski.Tim@epamail.epa.gov>
To: "Healy, Erin" <EHealy@icfi.com>
Cc: Tamara Kraus <tkraus@usgs.gov>, Jacob A Fleck <jafleck@usgs.gov>
Date: 05/07/2012 05:25 PM
Subject: reply requested: questions posed by ICF regarding MeHg and LICD (Bay Delta Conservation Plan)

Hi Erin:

You asked two good questions and I'm sending them to my colleagues at the USGS California Water Science Center in Sacramento (Tamara Kraus and Jacob Fleck). We three wrote the RARE proposal and power point presentation that you saw.

Dear Tamara and Jacob:

ICF (Erin Healy) contacted me shortly after EPA submitted comments on Conservation Measure #12 within the Bay Delta Conservation Plan (BDCP).

CM #12 addresses MeHg management in the context of wetlands restoration, and I raised some concerns with their proposed approaches, and also noted the work you're doing out on Twitchell Island with the carbon farm and LICD cells.

Erin is writing a memo that might be incorporated into the BDCP, so this is an excellent opportunity to attract additional attention to your research, and to potentially change the thinking about what should be done with the subsidized western Delta.

Ms. Healy has posed two questions that I wanted to cover without bothering you, but they are sufficiently technical that I thought they warranted your attention.

My responses are imbedded below in dark blue.

Please reply at your earliest convenience, and tell Erin and me how I did.

Feel free to correct me if I mischaracterize your views or USGS' official position.

Thanks, Tim

From: "Healy, Erin" <EHealy@icfi.com>
To: Tim Vendlinski/R9/USEPA/US@EPA
Date: 05/07/2012 12:02 PM
Subject: Mercury - BDCP

Hi Tim,

I reviewed a few things before putting the memo together and there are two issues that I wanted to get more information, or at least your thoughts on. I've jotted them down below. You can either respond by email, or we can talk if that works better. If we don't know the answers, that's fine – I just want to make sure I'm not missing anything.

1. The approach involves treatment cells – how do you envision restoration design that both restores natural hydrology and integrates a treatment cell? It seems that there has to be some mechanism to direct the flow out of the restored area to the treatment cell. This may be especially problematic with the tidal ebb and flow in tidal wetlands, which have the highest potential for production of methylmercury under BDCP.

Tim's response: USGS and EPA share the goal of beginning the long process of reversing subsidence in the western Delta by scaling-up the 14-acre "pilot wetlands/carbon farm" into farm-scale, wetlands restoration "units" covering 300-500 acres each. Other stakeholders have also pressed for reversing subsidence using USGS' carbon farming approach; most notably the Delta Conservancy and EDF. If the field experiments on the LICD test cells are successful, then USGS could advise restoration ecologists on how to design the wetlands restoration units.

My guess is that one or more treatment cells would be designed into each wetlands restoration unit where water is treated with coagulants before being discharged into Delta channels. My understanding is that, under the current land-use regime, water needs to be continuously pumped off the interior of the islands to prevent them from flooding. Disabling the pumps and letting the leases expire for corn farming are the first steps needed to being restoring natural hydrology to the islands. Once the pumping is halted, presumably water would begin pooling in the island's interior, and a positive "gravity flow" will be achieved to carry water from the island interior and into the Delta channels.

Water levels need to be managed carefully to grow the tules & cattails so they die and begin accreting into peat soils. We don't want the vegetation to decompose. The floc of the DOC and MeHg will be trapped in the accreting layers of vegetation within the treatment cells at the same time vegetation throughout the wetlands restoration unit is growing and accreting. The "land surface" of the treatment cell and the interior island will presumably increase together. For the time being, land managers (DWR?) might need to protect the interior island from the ebb and flow of tides until the accretion of tules and cattails takes hold and the reversal of subsidence is well underway.

2. By precipitating the methylmercury out, it would essentially be concentrating the mercury from a water body into a smaller depositional environment, with the risk that it could result in high concentrations in sediment. Has the group thought of any ways to address this? Maybe at this point sediment sampling and a mass balance for mercury and methylmercury entering/leaving the treatment cell needs to be included in the study design. I think that the sediment sampling is a bit problematic due to spatial heterogeneity, so that would need to be considered carefully in the design. Also, there could be changes over time in mercury concentrations as the mercury is taken out of the system – would need long term depth-incremental sediment sampling.

Tim's response: My understanding is that the MeHg is rendered relatively inert through the LICD-coagulation process. Yes, mercury will be concentrated within the treatment cells, but it will be in a relatively non-reactive form and trapped between accreting layers of tules and cattails. I tell people to think of a vegetarian lasagne where the spinach is the tules and the mozzarella is the mercury. My understanding is that a risk remains at the interface between the water column and sediments where MeHg might still be formed and mobilized, but this is a risk factor we may need to accept. Also, we may not live to see a gradual reduction of mercury over time because so much NEW mercury is being put into circulation from the mining and burning of coal, the manufacturing of cement, the distillation of petroleum, etc. The atmospheric mercury is deposited into the Delta in dry and wet phases, and may be a concern long after the "legacy mercury" entering the watershed from acid mine drainage (Gold Rush era) declines in volume. That's why we should consider positioning the "accommodation space" in the Delta as one of the world's greatest mercury (and carbon) storage systems.

Regards,
Erin

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